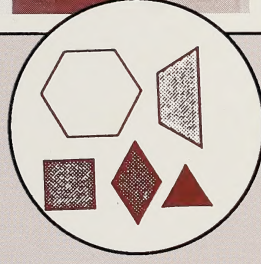


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RATIO
and PROPORTION
MODULE 5



MATHEMATICS 7



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Mathematics 7

Module 5: Ratio and Proportion

MODULE BOOKLET

Mathematics 7
Student Module
Module 5
Ratio and Proportion
Alberta Distance Learning Centre
ISBN No. 0-7741-0153-9

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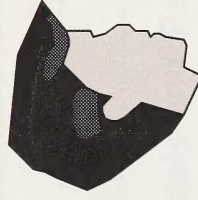
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Welcome to Module 5!

We hope you'll enjoy your study of Ratio and Proportion.

To make your learning a bit easier, a teacher will help guide you through the materials.

So whenever you see this icon,



turn on your audiocassette and listen.

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What Lies Ahead

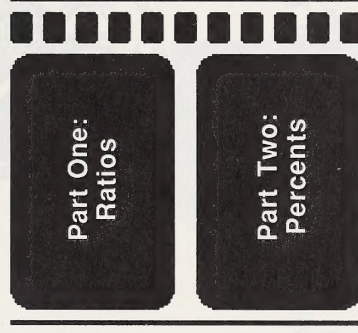
In this Module Introduction you will preview the module, and discover how the module will be evaluated.



Working Together

In Module 5 you will learn about ratio and proportion. This module has two parts.

This is how the module is organized:



Ratio and proportion is important in everyday life. Ratios are used to compare people and things.

Example

The Bearcats won the hockey game against the Falcons 3 to 2.

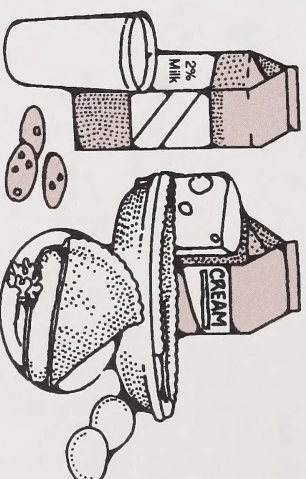


3 to 2 is the ratio of the number of goals scored by the Bearcats to the number of goals scored by the Falcons.

Percents are special ratios in which the second term is 100. Percents are also used to compare people and things.

Example

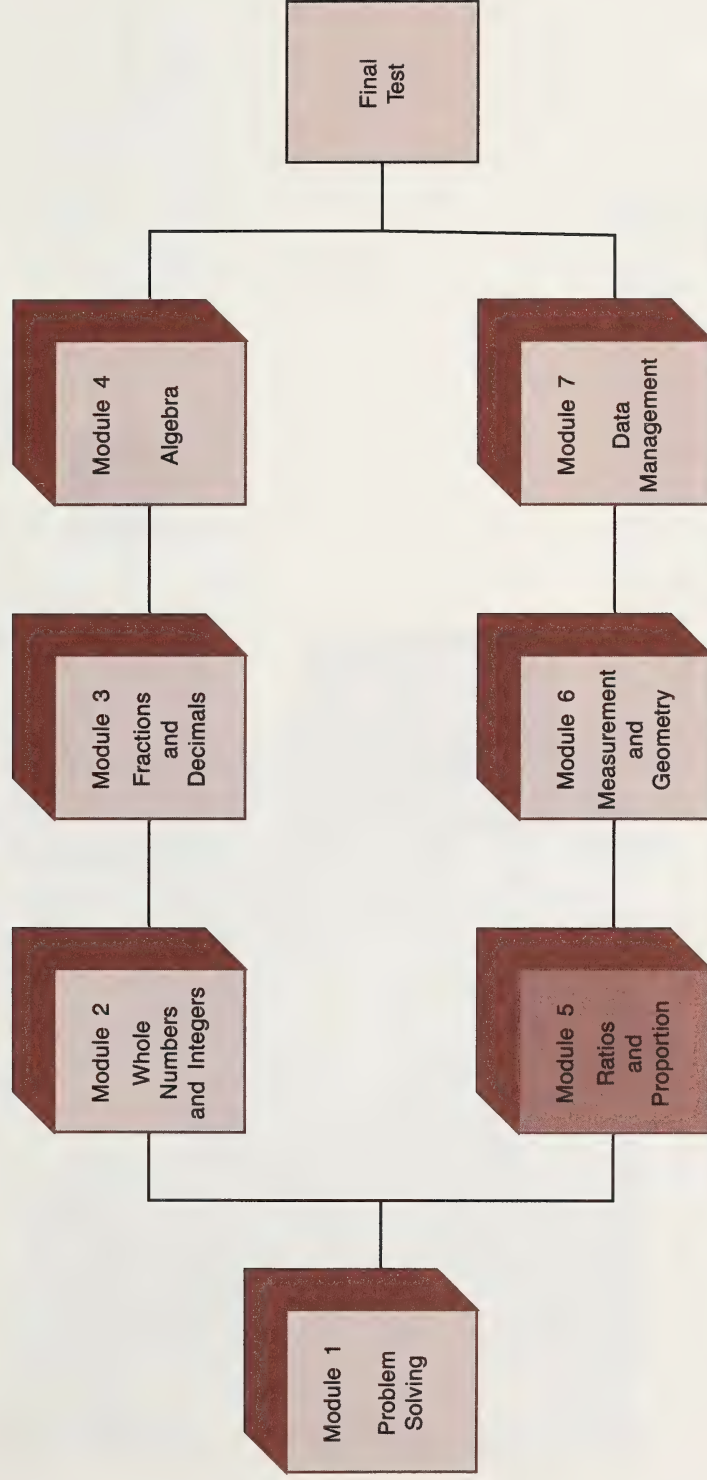
Partly-skimmed milk has 2% milk fat. Whipping cream has 35% milk fat.



2% milk fat means there are 2 parts of milk fat in 100 parts of partly-skimmed milk.

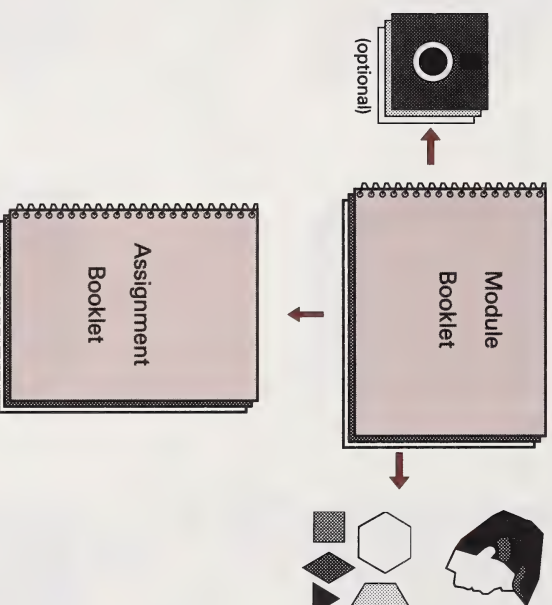
35% milk fat means there are 35 parts of milk fat in 100 parts of whipping cream.

Course Overview



Mathematics 7 has seven modules and a final supervised test. This booklet is one of the components of Module 5.

Module 5 Components



This Module booklet will give you instruction and practice in the skills and in the mathematical words you are required to learn in this module. It will also direct you to the other components of the module. The computer activities in this booklet are optional. There are print alternatives. You should see your learning facilitator to check your answers to the activities in this booklet.

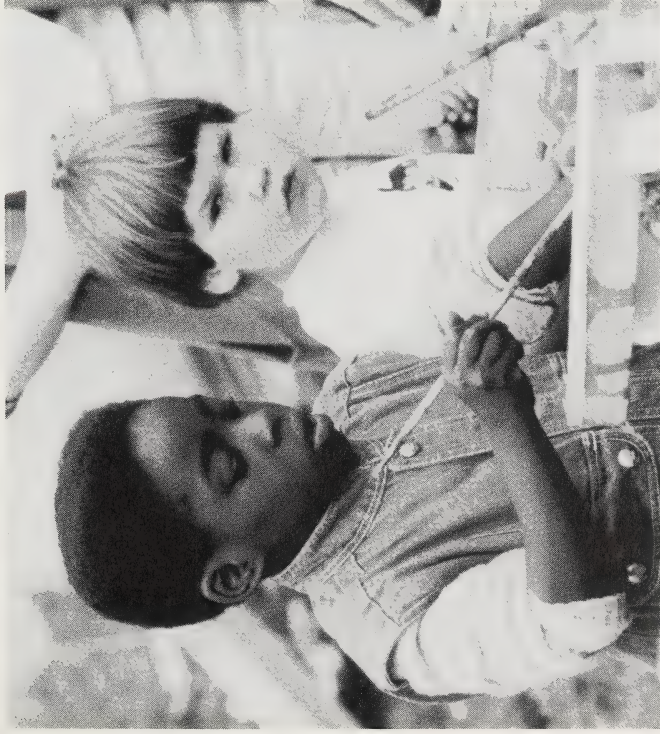
Your mark on this module will be determined by your work in the Assignment Booklet.

Take time to preview this module booklet now.

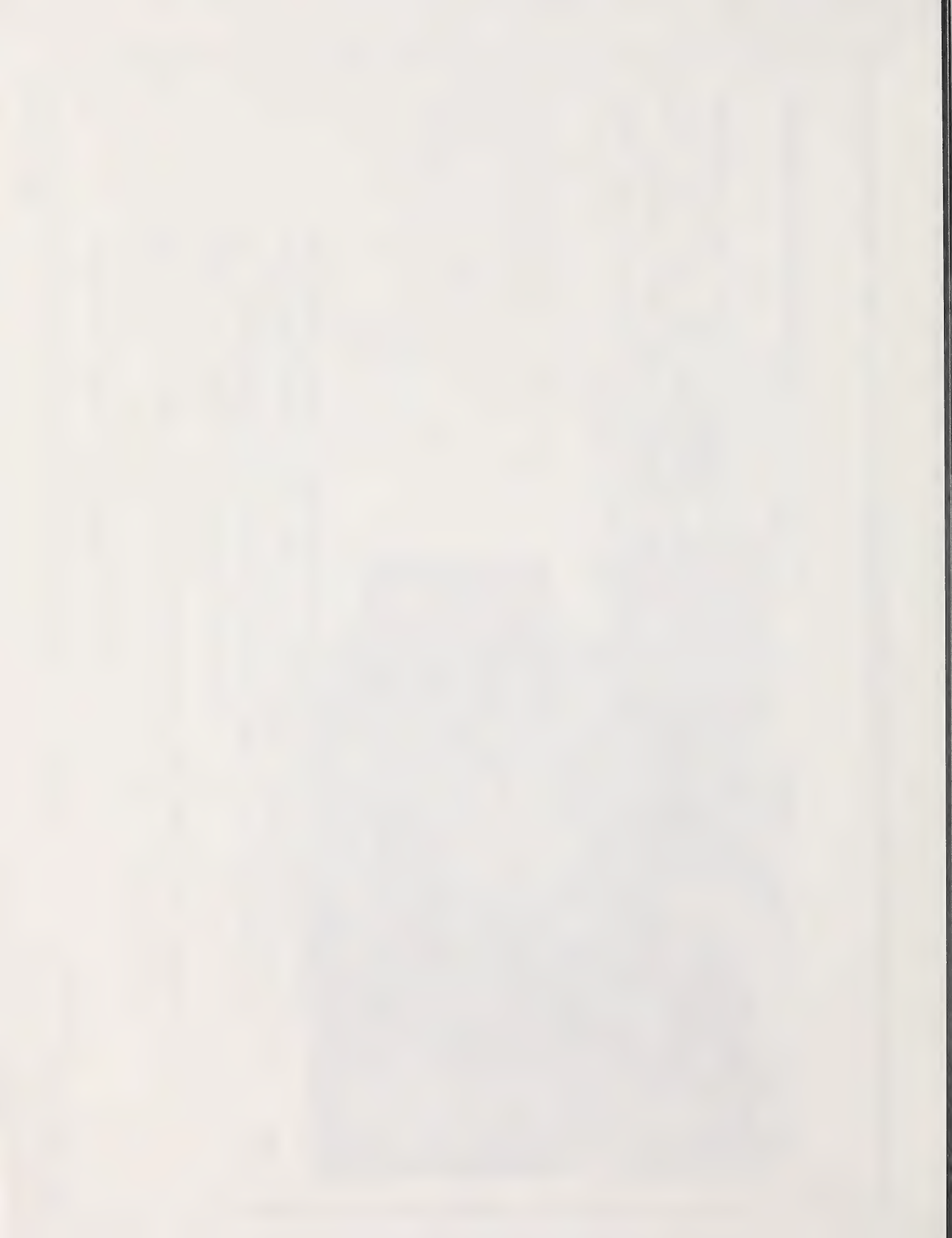
PART ONE

In Part One of this module you will be learning about ratio and proportion.

You probably already know some things about ratios from previous schooling. Ratios are abundant in everyday life. For example, the colour in this booklet is 8 parts yellow to 8 parts red to 1 part black. Painters need to know ratios when they mix colours to get different colours.



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What Lies Ahead

This section will test these skills.

- interpreting a ratio
- writing a ratio using colon form and fraction form
- writing equivalent ratios
- writing ratios in simplest form
- comparing and ordering ratios
- writing a proportion
- finding the missing term in a proportion



Working Together

Sections 1-6 deal with ratios.

The pretest in this section will help you and your learning facilitator determine your strengths and weaknesses.

Pretest

Space for Your Work

1. Write statements using these ratios to compare the number of objects in the diagram.

a. 2 to 5

b. 5 to 7



2. Write these ratios in simplest form.

a. the number of nickels to the number of dimes

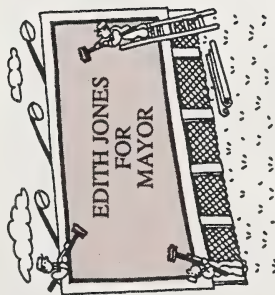
b. the value in cents of the nickels to the value in cents of the dimes

c. the value in cents of the nickels to the total value in cents



3. Write three equivalent ratios for each of the following.

a. 2 out of 3 people voted for Edith Jones.

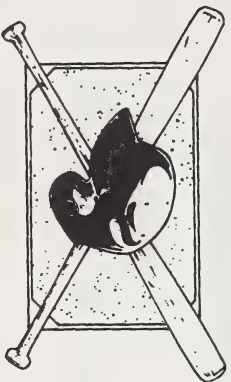


b. At the County Fair 20 student tickets were sold for every 5 adult tickets sold.



Space for Your Work

4. A baseball team won 36 out of 42 games during the season. It won 8 out of 11 games during the playoffs. Was the ratio of the number of games won to the number of games played better during the season or during the playoffs?



5. Matt sank 20 basketballs in 36 shots. Jon sank 10 basketballs in 18 shots. Are these ratios proportional?



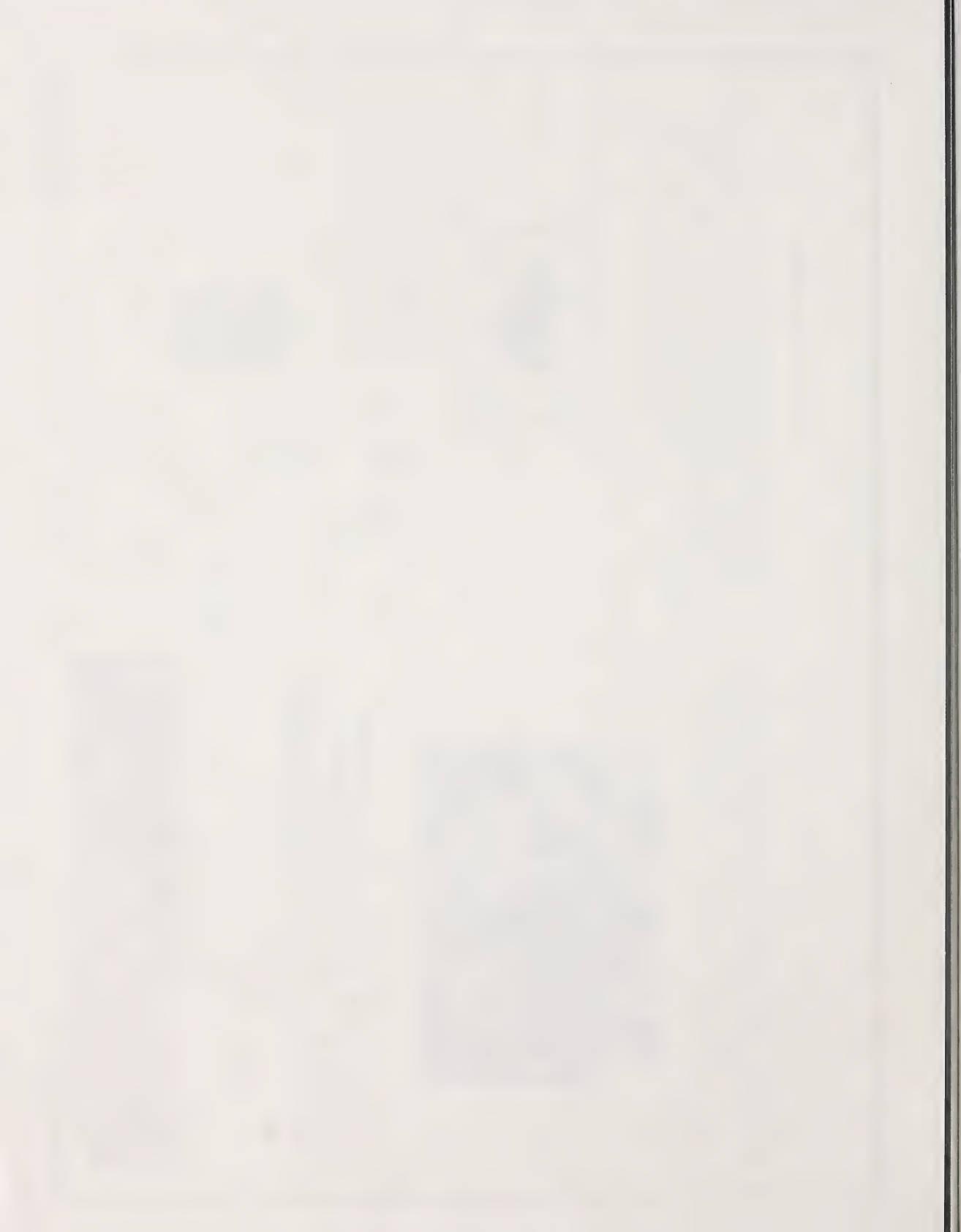
6. In Tara's class the ratio of the number of girls to the number of boys is 3 to 2. There are 18 girls in the class. How many boys are there in this class?



7. The ratio of the measure in mL of uncooked macaroni to the measure in mL of cooked macaroni is 1 to 3. How much cooked macaroni is made from 350 mL of uncooked macaroni?



See your learning facilitator to check your answers and to receive further instructions.



What Lies Ahead



In this section you will learn these skills.

- interpreting a ratio
- writing a ratio using a colon
- writing a ratio using its fraction form
- writing a ratio using its decimal form
- reading a ratio

In this section you will learn the meaning of these words.

- ratio
- term of a ratio
- first term of a ratio
- second term of a ratio



Working Together

Ratios are abundant in everyday life. Have you heard expressions like these?

- the pupil-teacher ratio
- the boy-girl ratio
- the win-loss ratio

If not, you will learn about them in this section.

There are many different ratios that can be used to describe a situation.

Example 1

This fish aquarium has 3 striped fish and 5 plain fish. Write statements comparing the number of fish.



Solution

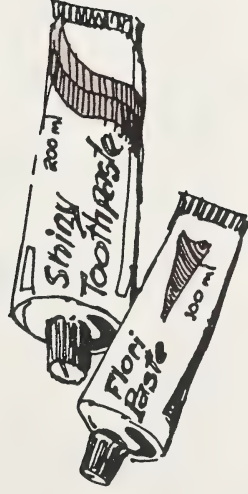
- The ratio of the number of striped fish to the number of plain fish is 3 to 5.
- The ratio of the number of plain fish to the number of striped fish is 5 to 3.
- The ratio of the number of striped fish to total number of fish is 3 to 8.
- The ratio of the number of plain fish to total number of fish is 5 to 8.

Note

When you use ratios, be sure to make a statement to indicate what is being compared. Also be careful of the order.

Example 2

The smaller tube contains 100 mL of toothpaste. The larger tube contains 200 mL. Write statements comparing these quantities.



Solution

- The ratio of the measure of toothpaste in the smaller tube to the measure of toothpaste in the larger tube is 100 to 200.
- The ratio of the measure of toothpaste in the larger tube to the measure of toothpaste in the smaller tube is 200 to 100.
- The ratio of the measure of toothpaste in the smaller tube to total measure of toothpaste is 100 to 300.
- The ratio of the measure of toothpaste in the larger tube to total measure of toothpaste is 200 to 300.

Note

When you are comparing quantities with the same units, the units are not mentioned.

Introductory Activities

Space for Your Work

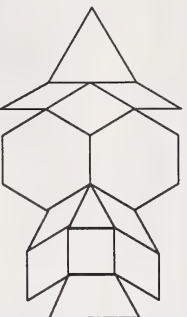
1. Use pattern blocks to make this design. Then write statements using these ratios.

a. 3 to 1

b. 4 to 3





c. 1 to 4

d. 3 to 14





2. Use the pattern in Question 1 and write as many statements as you can using 2 to 3.

3. Write statements comparing the cost in dollars of the objects in the diagram. Use these ratios.

a. 32 to 7	 \$7	 \$32
b. 8 to 17	 \$8	 \$17
c. 17 to 64		

4. Write statements comparing the capacity of the cans in the diagram. Use these ratios.

a. 400 to 300		
b. 300 to 700		
c. 400 to 700		

300 mL 400 mL

Space for Your Work

5. Write 3 statements using ratios comparing the value in cents of the coins in the diagram.



See your learning facilitator to check your answers and to receive further instructions.



Working Together

Writing Ratios With Colons

In the Introductory Activities, ratios were expressed using “to.” A colon can also be used to express a ratio.

Example 1

There are 3 brass instruments and 2 stringed instruments. Write the ratio of the number of brass instruments to the number of stringed instruments using a colon.



Solution

The ratio of the number of brass instruments to the number of string instruments is 3 : 2.



This is read as 3 to 2.

Example 2

There are 4 pencils and 3 brushes. Write the ratio of the number of pencils to the number of brushes using a colon.



Solution

The ratio of the number of pencils to the number of brushes is 4 : 3.

This is read as 4 to 3.

Note

4 is called the **first term** of the ratio and 3 is called the **second term** of the ratio.

4 : 3 is called a **two-term ratio**.

Writing Ratios in Fraction Form

A ratio can also be expressed in fraction form.

Example 1

This group of people has 2 women and 1 man.
Write the female-male ratio in fraction form.



Solution

The female-male ratio is $\frac{2}{1}$.



This is read as 2 to 1.

You can also say that the number of females is twice the number of males.

Example 2

There are 5 soccer balls and 1 football. Write the ratio of the number of footballs to total number of balls. Use the fraction form.



Solution

The ratio of the number of footballs to the total number of balls is $\frac{1}{6}$.

This is read as 1 to 6.

You can also say that the number of footballs is $\frac{1}{6}$ of the total number of balls.

This is read as 1 sixth.

Practice Activities

Print Alternative



1. There are 6 balls in the group of 10 items of sports equipment. What is the ratio of the number of balls to the total number of equipment items? Use the fraction form.



2. There are 5 roses and 8 daisies. Write the ratio for each of the following. Use the fraction form for your answers.

a. the number of roses to the number of daisies

b. the number of roses to the total number of flowers

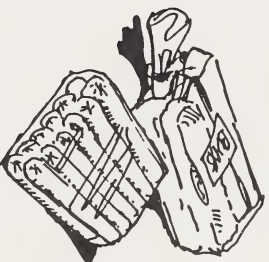


Space for Your Work

3. The Hawks hockey team won 41 games, lost 10 games and tied 29 games. Write the win-loss ratio. Use the colon form for the ratio.



4. There are 8 buns in a package. There are 12 weiners in a package. Write the ratio of the number of weiners to the number of buns. Use the colon form for the ratio.




Computer Alternative

Space for Your Work

5. Do Lesson 1, 2, 3, 4, 5 of the disk "Ratio and Percent" from the package *Computer Drill and Instruction: Mathematics, Level D* (SRA).



Read the instructions in the folder with the disk before using the program. Remember if you need help, press the SHIFT key and the  key.



See your learning facilitator to check your answers and to receive further instructions.



Working Together

Writing Ratios With Decimal Numbers

Occasionally, ratios are written in their decimal number form.

Example

The gear ratio of a bicycle compares the number of teeth on the front gear to the number of teeth on the back gear. What is the gear ratio of a 10-speed bicycle in which the front gear has 52 teeth and the back gear has 28 teeth?



Solution

Calculate the gear ratio.

You can use your calculator to find the decimal form.

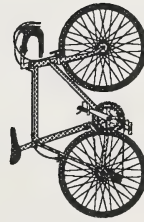
Key Press	Display
5	
2	
÷	
2	
8	
=	1.857142

$$\text{So } \frac{52}{28} \doteq 1.85$$

The gear ratio is about 1.85.

Concluding Activities

1. a. A five-speed bicycle has the gear ratios shown in the table at the right.



Complete the table by expressing the gear ratios in decimal number form rounded to the nearest thousandth.

- b. How do you think the different gear ratios affect pedalling?

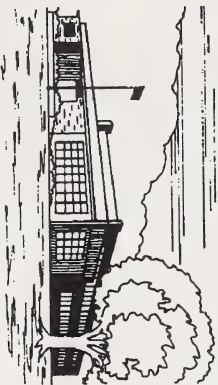
Space for Your Work

1. a.

Teeth on Front Gear	Teeth on Back Gear	Gear Ratio
40	28	
40	24	
40	20	
40	17	
40	14	

Space for Your Work

2. There are 128 students and 5 teachers in a school. Write the student-teacher ratio. Use the decimal number form for your answer.



✓ See your learning facilitator to check your answers and to receive further instructions.

What Lies Ahead



In this section you will learn these skills.

- finding equivalent ratios
- writing ratios in lowest terms

In this section you will learn the meaning of these words.

- equivalent ratio
- lowest terms



Working Together

Do you remember writing equivalent fractions in Module 3?

You can also write equivalent ratios. This section will show you how.

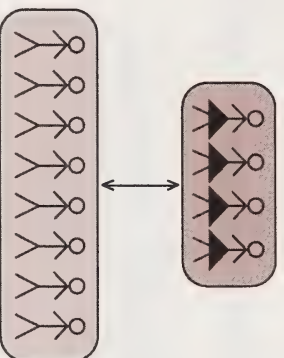
Writing equivalent ratios will help you compare ratios in Section 5.

Example 1

There are 4 girls to 8 boys. What is the ratio of the number of girls to the number of boys?

Solution

The ratio of the number of girls to the number of boys is 4 to 8.

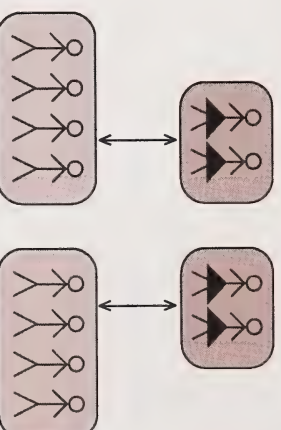


However, ratios with smaller terms are possible.

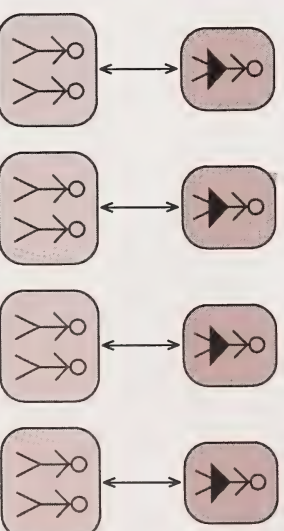
Note

In this example two different sets are being compared.

The ratio 4 to 8 can also be expressed as 2 to 4.
There are 2 girls to 4 boys.

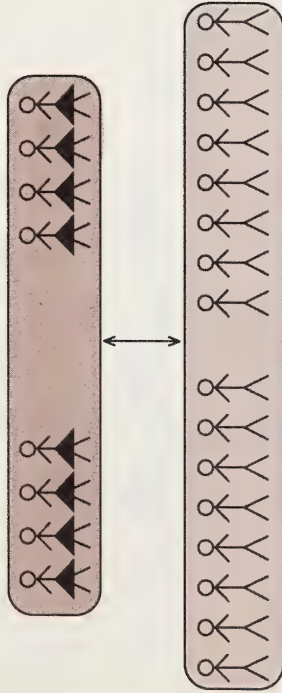


The 4 to 8 ratio can also be expressed as 1 to 2.
There is 1 girl to 2 boys.



Ratios with larger terms are possible. The ratio 4 to 8 could also be expressed as 8 to 16.

There would be 8 girls to 16 boys.



Note

In Example 1, all three ratios describe the same situation. They are **equivalent ratios**.

$$4 \text{ to } 8 = 2 \text{ to } 4 = 1 \text{ to } 2 = 8 \text{ to } 16$$

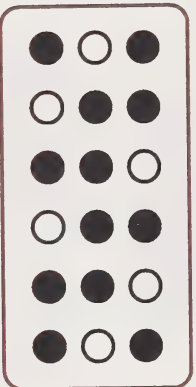
The ratio 1 to 2 is in **lowest terms**. That is, the terms in the ratio are the lowest whole numbers possible.

Example 2

There are 12 black marbles in 18 marbles. What is the ratio of the number of black marbles to the total number of marbles?

Solution

The ratio of the number of black marbles to the total number of marbles is 12 : 18.

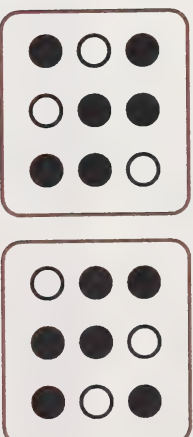


However, ratios with smaller terms are possible.

Note

In this example the elements of a set are being compared.

The ratio 12 : 18 can also be expressed as 6 : 9.
There are 6 black marbles in 9 marbles.

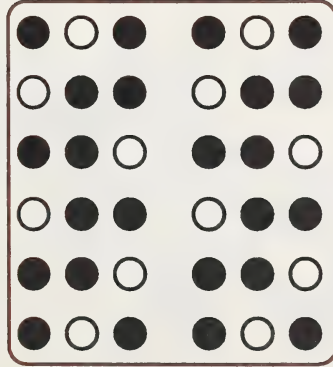


The ratio 12 : 18 can also be expressed as 2 : 3.
There are 2 black marbles in 3 marbles.



Ratios with larger terms are possible.

The ratio 12 : 18 could also be 24 : 36. There would be 24 black marbles in 36 marbles.



Note

In Example 2, all three ratios describe the same situation. They are **equivalent ratios**.

This is read as 2 to 3.

The ratio 2 : 3 is in **lowest terms**. The terms in the ratio are the lowest whole numbers possible. In each ratio, two-thirds of the marbles are black.

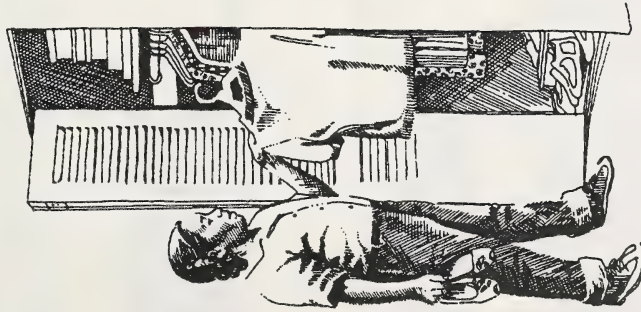
Introductory Activities

Space for Your Work

1. A piano class of 12 students has 4 boys. Use a diagram to show equivalent ratios of the number of boys to the number of students.



2. Janice has 6 shirts and 4 pairs of slacks. Use a diagram to show equivalent ratios of the number of slacks to the number of shirts.



✓ See your learning facilitator to check your answers and to receive further instructions.

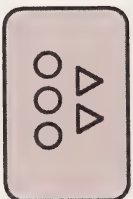


Working Together

You can use multiplication or division to write equivalent ratios.

Example 1

The ratio of the number of triangles to the number of circles is 2 to 3.



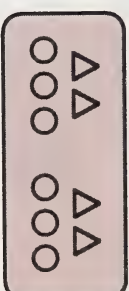
Write two equivalent ratios using multiplication.

Note

The elements of a set are being compared in this example.

Solution

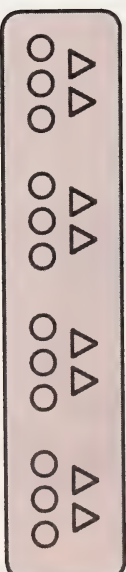
$$\begin{array}{c} \left(\begin{array}{c} 2 \\ 3 \end{array} \right) \begin{array}{c} \times 2 \\ \times 2 \end{array} \\ \hline \left(\begin{array}{c} 4 \\ 6 \end{array} \right) \end{array}$$



and

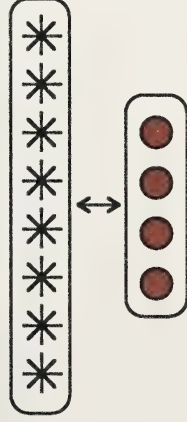
$$\begin{array}{c} \left(\begin{array}{c} 2 \\ 3 \end{array} \right) \begin{array}{c} \times 4 \\ \times 4 \end{array} \\ \hline \left(\begin{array}{c} 8 \\ 12 \end{array} \right) \end{array}$$

The graphics show you why.



Example 2

The ratio of the number of jacks to the number of balls is 8 to 4.



Write two equivalent ratios using division.

Note

The two different sets are being compared in this example.

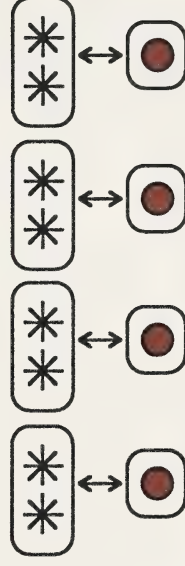
Solution

$$\begin{array}{r} \div 2 \\ 8 \\ \hline 4 \end{array} = \begin{array}{r} 4 \\ \hline 2 \end{array} \quad \div 2$$

and

$$\begin{array}{r} \div 4 \\ 8 \\ \hline 4 \end{array} = \begin{array}{r} 2 \\ \hline 1 \end{array} \quad \div 4$$

The graphics show you why.



The ratio 2 to 1 is in lowest terms. That is, the terms in the ratios are the lowest whole numbers possible.

Practice Activities

Space for Your Work

1. Use multiplication or division to write an equivalent ratio for each of the following.
 - a. The ratio of the number of boxes to the number of bags is 3 to 5.
 - b. The ratio of the number of triangles to the number of squares is 6 to 4.

2. Express each ratio given in lowest terms.
- a. The ratio of the number of cars to the number of bicycles is 8 to 12.
 - b. The ratio of the number of dogs to the number of cats is 5 to 10.
 - c. The ratio of the number of pens to the number of pencils is 12 to 30.



See your learning facilitator to check your answers and to receive further instructions.

Concluding Activities

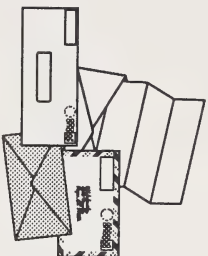
Space for Your Work

1. Draw a set of 9 shapes for which the ratio of the number of circles to the number of triangles is 1 to 2.
2. Draw a set with more than 9 shapes for which the ratio of the number of circles to the number of triangles is 1 : 2.

Space for Your Work

3. Draw a set with more than 3, but less than 9 shapes, for which the ratio of the number of circles to the number of triangles is $\frac{1}{2}$.
4. A set of shapes contains 6 squares and some triangles. The ratio of the number of triangles to the number of squares is 2 to 3. Draw the set of shapes.

5. Jane has 40 stamps. The ratio of the number of Canadian stamps to the number of foreign stamps is 3 to 1. How many stamps of each type does she have?



6. Write the ratio in simplest form for each of these situations.

- a. the number of dimes in a dollar to the number of quarters in a dollar



- b. the number of dimes in three dollars to the number of quarters in three dollars

c. the value in cents of a dime to the value in cents of a quarter

d. the value in cents of a dime to the value in cents of a dollar

Computer Alternative

7. If you have access to a computer, do Program 9A of Disk B of MAC 8 (Ratio Rendezvous). Read the instructions in the folder with the disk before using the program.



See your learning facilitator to check your answers and to receive further instructions.



What Lies Ahead



In this section you will learn these skills.

- comparing ratios
- ordering ratios from largest to smallest or from smallest to largest
- determining if situations are proportional

In this section you will learn these terms.

- golden ratio
- gear ratio
- proportion
- proportional ratio
- proportional



Working Together

Comparing and ordering are important skills in mathematics.

In Module 2 you compared and ordered whole numbers and integers.

$$832 > 821$$

$$-5 > -8$$

In Module 3 you compared and ordered fractions and decimals.

$$\frac{3}{4} > \frac{1}{4}$$

$$\frac{5}{8} > \frac{1}{2}$$

$$0.75 > 0.25$$

$$0.8 > 0.15$$

In this section you will compare and order ratios.

Example 1

In a cake recipe, the ratio of the measure of flour to the measure of sugar is 3 : 1. In another cake recipe, the ratio of the measure of sugar to the measure of flour is 3 : 1. Which recipe makes sweeter cakes?



Solution

The recipe with the greater ratio of sugar to flour will be sweeter.

The ratios in the problem are not written in the same order. Rewrite the ratios comparing sugar to flour.



Recipe #1

$$\frac{1}{3}$$

Recipe #2

$$\frac{3}{1}$$

Now compare the ratios.

$$\frac{3}{1} > \frac{1}{3}$$

So the second recipe is sweeter.

Example 2

Harry hits safely in 5 out of 9 times at bat. Willy hits safely in 7 out of 9 times at bat. Which batter has the greater ratio of hits to times at bat?



Solution

Because Harry and Willy have both been up to bat 9 times, it is easy to compare the ratios.

Write the ratios of hits to times at bat.

	Willy	Harry
$\frac{\text{number of hits}}{\text{number of times at bat}}$	$\frac{5}{9}$	$\frac{7}{9}$

Because the second terms are the same, you can compare the first terms.

$$\begin{array}{l} 7 > 5 \\ \text{So } \frac{7}{9} > \frac{5}{9} . \end{array}$$

Willy has the greater ratio of hits to times at bat.

Example 3

Linda hits safely in 5 out of 8 times at bat. Janet hits safely in 7 out of 10 times at bat. Who has the greater ratio of hits to times at bat?



Solution

Because Linda and Janet have been up to bat a different number of times, it is difficult to compare these ratios.

Write the ratios of hits to times at bat.

$$\frac{\text{number of hits}}{\text{number of times at bat}}$$

$$\begin{array}{cc} \text{Linda} & \text{Janet} \\ \frac{5}{8} & \frac{7}{10} \end{array}$$

Find equivalent ratios with the same second term.

$$\frac{\text{number of hits}}{\text{number of times at bat}}$$

$$\begin{array}{cc} \text{Linda} & \text{Janet} \\ \frac{5}{8} = \frac{25}{40} & \frac{7}{10} = \frac{28}{40} \end{array}$$

Because the second term is the same you can compare the first terms:

$$\begin{array}{l} 28 > 25 \\ \frac{28}{40} > \frac{25}{40} \end{array}$$

$$\text{and } \frac{7}{10} > \frac{5}{8}$$

Therefore, Janet has the greater ratio of hits to times at bat.

Here is another way to do Example 3.

Change the ratios into their decimal number form by dividing.

Janet
$$\begin{array}{r} 0.7 \\ 10 \overline{) 7.0} \\ \underline{70} \end{array} \quad \frac{7}{10} = 0.7$$

Linda
$$\begin{array}{r} 0.625 \\ 8 \overline{) 5.000} \\ \underline{48} \\ 20 \\ \underline{16} \\ 40 \\ \underline{40} \end{array} \quad \frac{5}{8} = 0.625$$

Then compare the decimal numbers:

$$0.7 = 0.700$$

$$0.7 > 0.625$$

$$\text{So } \frac{7}{10} > \frac{5}{8}$$

Therefore, Janet has the greater ratio of hits to times at bat.

A calculator can be used to find the decimal number forms.

Key Press	Display
$\boxed{7} \boxed{\div} \boxed{1} \boxed{0}$	$\boxed{0.7}$
Key Press	Display
$\boxed{5} \boxed{\div} \boxed{8}$	$\boxed{0.625}$

Introductory Activities

Space for Your Work

1. Last year a bowling team won 90 out of 162 games. So far this year they have won 10 out of 12 games. Is the team doing better or worse this year than it did last year?



2. In three games a basketball player made 7 of 10, 9 of 20 and 3 of 5 shots.



- In which game did the player have the greatest success?
- In which game did the player have the least success?

3. Matt and Jon play wheelchair basketball. Matt sank 6 out of 9 basketball shots. Jon sank 9 out of 15. Which of these two players is a more accurate shooter?



4. Kara scored 17 out of 25 on the first test and 14 out of 20 on the second test. On which test did she do better?



6. Yuriko spelled 35 out of 40 words correctly. Derek spelled 49 out of 56 words correctly. Who is the better speller?



Computer Alternative

7. If you want further practice, do

Lesson 7 of the "Ratio and Percent" disk from the Package SRA Computer Drill and Instruction: Mathematics, Level D (SRA). Read the instructions in the folder with the disk before using the program.



Remember if you need help, press the SHIFT key and the  key.

See your learning facilitator to check your answers and to receive further instructions.



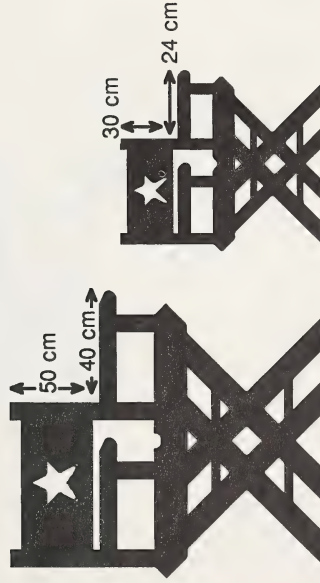


Working Together

Proportions

Example 1

Look at these chairs. How do the ratios of the depth of the seat to the height of the back compare?



Solution

Write the ratios, then show each ratio in simplest form.

	Big Chair	Small Chair
<div style="border: 1px solid black; border-radius: 15px; padding: 10px; display: inline-block;"> $\frac{\text{depth of seat in cm}}{\text{height of back in cm}}$ </div>	$\frac{50}{40}$	$\frac{30}{24}$

$$\begin{array}{ccc} \leftarrow + 10 & & \leftarrow + 6 \\ \frac{50}{40} = \frac{5}{4} & = & \frac{30}{24} = \frac{5}{4} \\ \leftarrow + 10 & & \leftarrow + 6 \end{array}$$

Since both ratios have the same simplest form, they are **equivalent ratios**.

$$\frac{30}{24} = \frac{50}{40}$$

When ratios are equivalent, they are also called **proportional ratios**.

An equation showing that two ratios are equivalent is called a **proportion**.

You can also say the chairs are **proportional** in size.

Here's a short cut for Example 1.

Write the ratios.

	Big Chair	Small Chair
$\frac{\text{depth of seat in cm}}{\text{height of back in cm}}$	$\frac{50}{40}$	$\frac{30}{24}$

Find the cross products of the ratios.

$$\begin{array}{cc}
 \begin{array}{|c|} \hline 50 \times 24 = 1200 \\ \hline \end{array} & \begin{array}{c} \frac{50}{40} \nearrow \searrow \frac{30}{24} \\ \times \end{array} & \begin{array}{|c|} \hline 40 \times 30 = 1200 \\ \hline \end{array}
 \end{array}$$

Compare the cross products.

$$1200 = 1200$$

$$\text{So } \frac{50}{40} = \frac{30}{24}$$

The size of the chairs are proportional since the ratios are equivalent.

Note

Finding and comparing the cross products is a short-cut to finding the first terms of each ratio when the second terms are equivalent.

$$\begin{array}{c}
 \begin{array}{|c|} \hline 50 \\ \hline \end{array} \begin{array}{c} \nearrow \searrow \\ \times \end{array} \begin{array}{|c|} \hline 24 \\ \hline \end{array} \\
 = \\
 \begin{array}{|c|} \hline 40 \\ \hline \end{array} \begin{array}{c} \nearrow \searrow \\ \times \end{array} \begin{array}{|c|} \hline 30 \\ \hline \end{array} \\
 = \\
 \begin{array}{|c|} \hline 1200 \\ \hline \end{array} \begin{array}{c} \nearrow \searrow \\ \times \end{array} \begin{array}{|c|} \hline 24 \\ \hline \end{array} \\
 = \\
 \begin{array}{|c|} \hline 960 \\ \hline \end{array}
 \end{array}$$

$$\begin{array}{c}
 \begin{array}{|c|} \hline 30 \\ \hline \end{array} \begin{array}{c} \nearrow \searrow \\ \times \end{array} \begin{array}{|c|} \hline 40 \\ \hline \end{array} \\
 = \\
 \begin{array}{|c|} \hline 24 \\ \hline \end{array} \begin{array}{c} \nearrow \searrow \\ \times \end{array} \begin{array}{|c|} \hline 40 \\ \hline \end{array} \\
 = \\
 \begin{array}{|c|} \hline 960 \\ \hline \end{array}
 \end{array}$$

Example 2

The Falcons won 11 games and lost 3. The Hawks won 13 games and lost 4. Are the ratios of the number of wins to the number of losses proportional in these situations?



Solution

Write the ratios.

<div><div>wins</div><div>losses</div></div>	Falcons	Hawks
	$\frac{11}{3}$	$\frac{13}{4}$

Show each ratio with the same second term.

$$\frac{11}{3} = \frac{44}{12} \quad \begin{matrix} \nearrow \times 4 \\ \nwarrow \times 3 \end{matrix}$$

Compare the first terms.

$$44 > 39$$

$$\text{So } \frac{44}{12} > \frac{39}{12}$$

$$\text{and } \frac{11}{3} > \frac{13}{4}$$

No, the ratios are **not** proportional.

Here is a short cut for Example 2.

Write the ratios.



Falcons

Hawks

$$\frac{11}{3}$$

$$\frac{13}{4}$$

Find the cross products of the ratios.

$4 \times 11 = 44$

$\frac{11}{3} \times \frac{13}{4}$

$3 \times 13 = 39$

Compare the cross products.

$$44 > 39$$

So $\frac{11}{3} > \frac{13}{4}$

Note

Finding the cross products, is a short-cut to finding the first terms of each ratio when the second terms are equivalent.

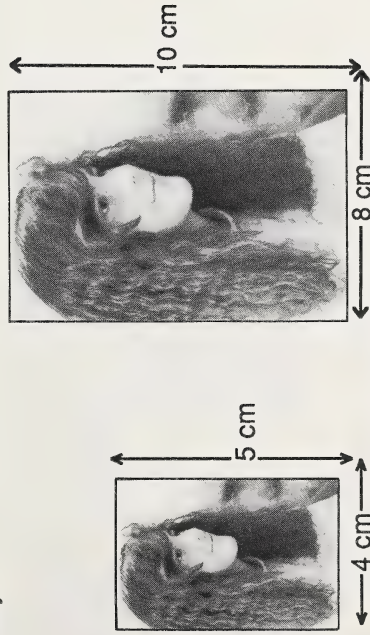
$$\frac{11}{3} = \frac{44}{12}$$

$$\frac{13}{4} = \frac{39}{12}$$

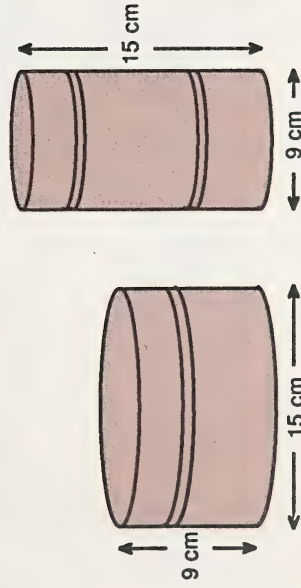
Practice Activities

Space for Your Work

1. Are the sizes of the photographs proportional? Why?



2. Are the sizes of the two cans proportional? Explain.



3. What are the ratio of the number of hens to the number of eggs in these pictures? Are the ratios proportional? Why or why not?

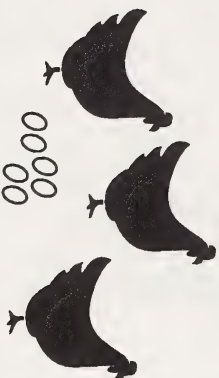
a.



b.



c.

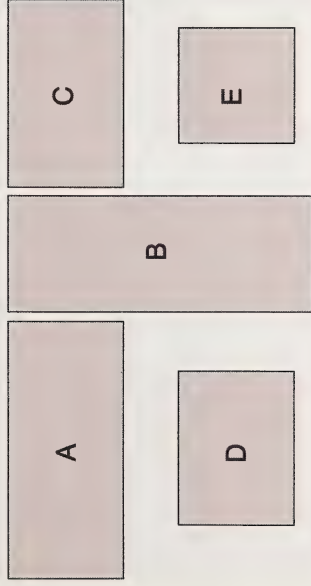


See your learning facilitator to check your answers and to receive further instructions.

Concluding Activities

Space for Your Work

1. Consider the following rectangles.

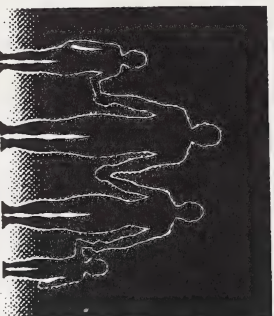


- Which of these appeals most to your eye?
- For each rectangle, measure its length and width. Use your calculator to find the ratio of its length to its width. Give each ratio in its decimal number form rounded to the nearest tenth.
- The ancient Greeks felt that the rectangles that were most appealing to the eye were those in which the ratio of the length to width was 1.618. They called this the **golden ratio**. They used rectangles with this ratio in many of their buildings.

Are any of the ratios in Part b of this question close to the golden ratio? If so, which one?

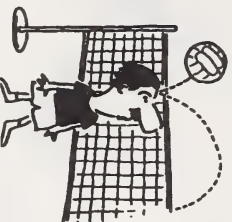
Space for Your Work

2. a. Artists know that the body has certain proportions and use these proportions in their work. Recruit 3 friends and measure the heights of their heads and the heights of their bodies. Then use these measurements to find the ratio of the height of the body to the height of the head.



	Person #1	Person #2	Person #3
height of body			
height of head			
ratio of height of body to height of head			

- b. What do you notice about the ratios in Part a?
- c. Examine the cartoon character below. What do you notice?



See your learning facilitator to check your answers and to receive further instructions.



What Lies Ahead

In this section you will learn these skills.

- writing a proportion
- finding the missing term of a proportion

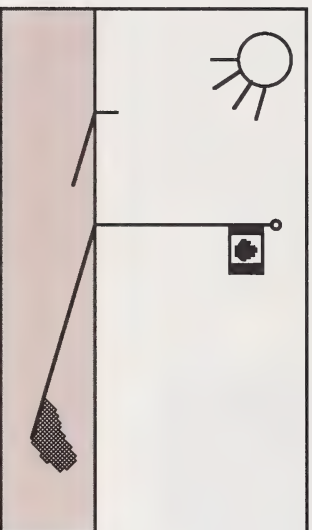


Working Together

Proportions are very helpful. They allow you to find a missing term of a ratio if you are given one term of the ratio and a proportional ratio.

Example 1

Cal measured the shadow of a metre stick and of a flagpole at the same time of day. The shadow of the metre stick was 3 m long. The shadow of the flagpole was 15 m long. How high is the flagpole?



Solution

Write the ratios.

$\frac{\text{height of object in m}}{\text{length of its shadow in m}}$	metre stick flag pole
$\frac{1}{3}$	$\frac{1}{\frac{\square}{15}}$

Write the proportion.

$$\frac{1}{3} = \frac{\square}{15}$$

Find the missing term:

$$\frac{1}{3} = \frac{\boxed{5}}{15}$$

$\begin{matrix} \nearrow \times 5 \\ \nwarrow \times 5 \end{matrix}$

The flagpole is 5 m high.

Note

When you write a proportion, it is very important that you put the terms in the correct order. In the above solution the first terms of both ratios are the heights of objects and the second terms are the lengths of the shadows.

Practice Activities

Space for Your Work

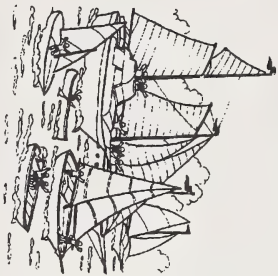
1. In a restaurant, the ratio of the number of staff to the number of customers is 3 : 13. There are nine staff people. How many customers are there?



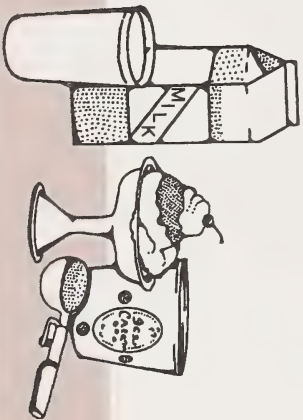
2. Maria's mass and Jean's mass are in the ratio of 5 : 4. Maria's mass is 45 kg. What is Jean's mass?



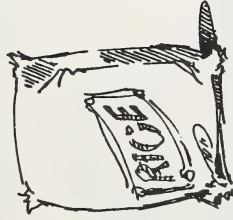
3. The ratio of canoes to sailboats on Thunder Lake is 7 to 2. There are 21 canoes. How many sailboats are there?



4. The ratio of ice cream to milk in a milkshake is 1 to 3. If Krish uses 250 mL of ice cream, how much milk should he use?



5. The ratio of uncooked rice to cooked rice is 1 to 5. How much uncooked rice is needed to make 250 mL of cooked rice?



6. Frozen orange juice concentrate is mixed with water in the ratio of 1 : 3. How much water is needed if you use 300 mL of concentrate?



✓ See your learning facilitator to check your answers and to receive further instructions.

Extra Practice

Space for Your Work

Computer Alternative



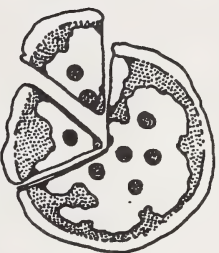
1. Do Lesson 8 of the "Ratio and Percent" disk from the Package SRA *Computer Drill and Instruction: Mathematics, Level D*. Read the instructions in the folder with the disk before using the program.

Remember if you need help, press the SHIFT key and the  key.

Print Alternative



2. If 2 large pizzas serve 5 people, how many large pizzas are needed to serve 20 people?



3. To make a certain shade of orange, 3 parts of yellow are mixed with 4 parts of red. An artist is going to use 60 mL of yellow paint to make this shade of orange. How much red paint is needed?

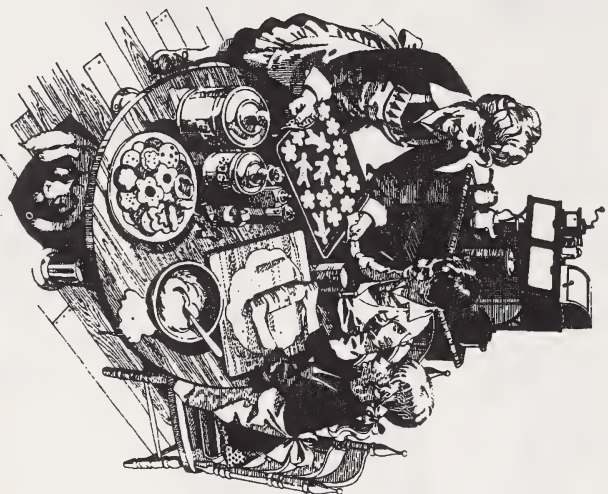


4. For every 3 loaves of bread a food bank gives away, it gives away 10 oranges. In one day 57 loaves of bread were given away. How many oranges were given away on the same day?



Space for Your Work

5. A cookie recipe calls for 2 parts of flour to 1 part of sugar. Tom uses 350 mL of flour. How much sugar does Tom need to make these cookies?



See your learning facilitator to check your answers and to receive further instructions.

Concluding Activities

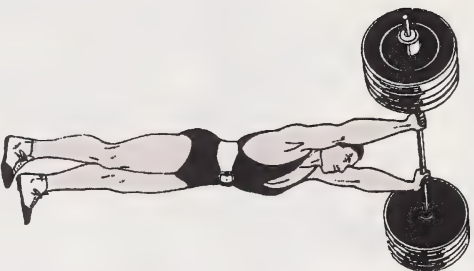
1. a. In spite of their small size, ants can lift surprisingly heavy objects. Some ants can lift objects that are 50 times heavier than their bodies. What is the ratio of the mass of an ant to the mass it can lift?
- b. How much mass can a 0.25-g ant lift?



Space for Your Work

Space for Your Work

2. a. If your strength was proportional to an ant's, how much mass could you lift?



- b. How much can you really lift?
- c. What is the ratio of your mass to the mass you can lift?



See your learning facilitator to check your answers and to receive further instructions.

What Lies Ahead



In this section you will review the skills you have learned in Sections 1-5.

- interpreting a ratio
- writing a ratio using colon form and fraction form
- writing equivalent ratios
- writing ratios in simplest form
- comparing and ordering ratios
- writing a proportion
- finding the missing term for a ratio in a proportion



Working Together

Turn to Section 1 in this Module Booklet and correct any errors you may have made in the Pretest. You may be pleasantly surprised to discover how much you have learned about ratios!



PART TWO

In Part Two of this module you will be learning about percents.

Percents are special ratios. They are abundant in everyday life.

For example, the amount of milk fat in partly-skimmed milk is 2 parts out of 100 parts. Whipping cream has 35 parts of milk fat out of 100 parts.



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What Lies Ahead



In this section you will test your knowledge of these skills.

- expressing a ratio, out of 100, as a percent
- expressing a ratio, not out of 100, as a percent
- expressing a percent as a decimal and a fraction
- expressing a decimal and a fraction as a percent
- finding a percent of a number



Working Together

Part Two deals with percents. The following pretest will help you and your learning facilitator determine your strengths and weaknesses.

Pretest

Space for Your Work

1. In a package of 100 gummed stars there are 28 blue, 13 gold, 23 green and 15 silver stars. The rest are red. Express the number of stars of each color as a percent of the total.



2. Express each ratio below as a percent.

a. $\frac{27}{100}$

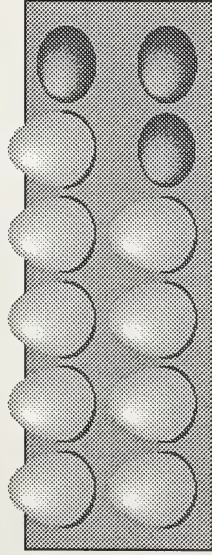
b. 20 : 100

c. 12 out of 20

d. $\frac{15}{25}$

e. 6 : 10

3. a. What percent of the egg carton below is full?
- b. What percent of the egg carton below is empty?



4. Rewrite each of these sentences using a percent.
 - a. The team won 0.85 of its games.
 - b. During a sale the price was reduced by $\frac{1}{2}$.
 - c. Maria scored 18 out of 25 on a test.

5. Express each decimal number as a percent.

a. 0.35

b. 0.07

c. 0.4

d. 0.62

6. Express each fraction given as a percent.

a. $\frac{23}{100}$

b. $\frac{3}{10}$

c. $\frac{4}{5}$

d. $\frac{8}{200}$

e. $\frac{7}{25}$

7. Express each percent given as a decimal number and as a fraction in lowest terms.

- a. 45%
- b. 9%
- c. 20%
- d. 16%

8. Estimate the answer for each of the following.

- a. 40% of 102
- b. 22% of 10
- c. 66% of 300

9. Calculate the answer for each of the following.
- a. 48% of 2000
 - b. 22% of 10
 - c. 66% of 300
10. About 20% of Canada's population is under the age of 15. In 1986 the population was about 25 000 000.
- a. About how many people in Canada were under 15?
 - b. About how many people in Canada were over 15?



See your learning facilitator to check your answers and to receive further instructions.

What Lies Ahead



In this section you will learn these skills.

- interpreting percent
- expressing a ratio as a percent

In this section you will learn the meaning of this word and this symbol.

- percent
- %



Working Together

Numbers have many different but equivalent forms. In the first part of this module you expressed ratios in their colon form, in their fraction form and in their decimal number form.

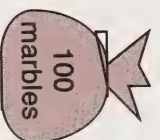
In this part of the module you will discover that ratios can be expressed as percents.

Interpreting Percent

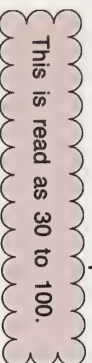
A percent is a special ratio whose second term is always 100. To write a percent, replace the 100 with the percent symbol, %. The percent symbol is a short way to write "per 100."

Example 1

In a bag of 100 marbles 30 are red.



The ratio of red marbles to total marbles is $\frac{30}{100}$.



So 30% of all the marbles are red.

Note

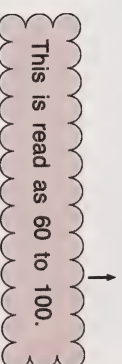
In this example, 100 represents the whole. 30 represents part of a whole.

Example 2

In a bag of 200 marbles, 60 are red and 100 are blue.



The ratio of red marbles to blue marbles is $\frac{60}{100}$.



So the number of red marbles is 60% of the number of blue marbles.

Note

In this example, 60 and 100 represent two distinct groups.

Introductory Activities

Space for Your Work

1. On a mathematics test George answered 72 out of 100 questions correctly. Express this as a percent. Write a statement.

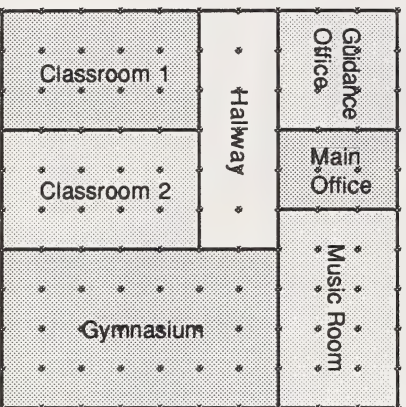


2. The ratio of men to women at a banquet was 94 to 100. Express this as a percent. Write a statement.




3. What percent of the floor room is each of the following?

- guidance office
- main office
- music room
- gymnasium
- hallway
- classroom 1
- classroom 2



4. What do all the percents in Question 3 total?
5. Raju was ill 3 days in every 100 days and was absent from school.
 - a. What percent of the time was he ill?
 - b. What percent of the time was he able to attend classes?



 See your learning facilitator to check your answers and to receive further instructions.



Working Together

Solution

Writing Other Ratios as Percents

Ratios that do not have second terms of 100, can also be written as percents.

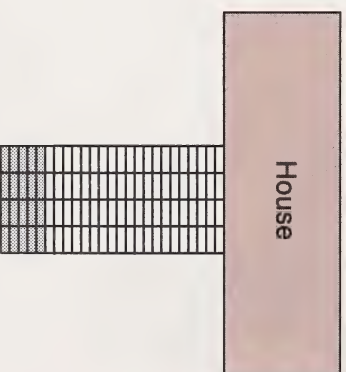
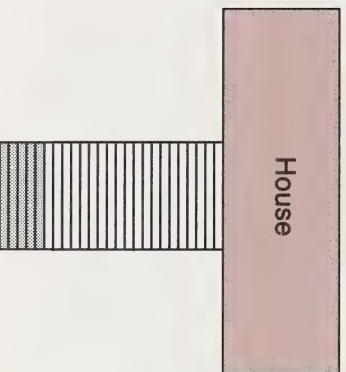
Example 1

5 of the 25 blocks in this walk have been shoveled. Express the ratio of the number of shoveled blocks to the total number of blocks as a percent.

The ratio of the number of shoveled blocks to the total number of blocks is $\frac{5}{25}$.

This is read as 5 to 25.

Divide the walk into 100 parts.



Now the ratio of the number of shoveled blocks to the total number of blocks is $\frac{20}{100}$.

So 20% of all the blocks are shoveled.

Here is another way to do Example 1.

Find an equivalent ratio whose second term is 100.

$$\frac{5}{25} = \frac{\boxed{}}{100}$$

$$\frac{5}{25} = \frac{\boxed{20}}{100} \quad \begin{array}{c} \nearrow \times 4 \\ \nwarrow \times 4 \end{array}$$

The ratio of the number of shoveled blocks to the total number of blocks is $\frac{20}{100}$.

So 20% of all the blocks are shoveled.

Example 2

Express the ratio of shoveled blocks to unshoveled blocks as a percent.

The ratio of the number of shoveled blocks to the number of unshoveled blocks is $\frac{5}{20}$.

Find an equivalent ratio whose second term is 100.

$$\frac{5}{20} = \frac{\boxed{}}{100}$$

$$\frac{5}{20} = \frac{\boxed{25}}{100} \quad \begin{array}{c} \nearrow \times 5 \\ \nwarrow \times 5 \end{array}$$

The ratio of the number of shoveled blocks to the number of unshoveled blocks is $\frac{25}{100}$.

$$\frac{25}{100} = 25\%$$

In other words, the number of blocks shoveled is 25% of the number of blocks unshoveled.

Practice Activities

Space for Your Work

1. If 2 out of 25 bulbs tested by the Bright Light Company fails, what percent of the bulbs failed?



2. There are 17 boys to 20 girls on the bus.
Express this ratio as a percent. Use a statement.



3. Janice received these marks on five tests.

Language Arts	19 out of 25
Mathematics	42 out of 50
Science	9 out of 10
Social Studies	16 out of 20
French	82 out of 100



- Express each mark to a percent.
- Rank the test results from the highest percent to the lowest percent.

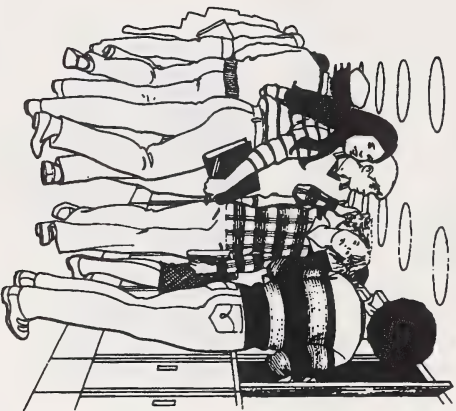


See your learning facilitator to check your answers and to receive further instructions.

Concluding Activities

Space for Your Work

The student council had 2 candidates for president. Suzanne got 3 votes for every 2 votes that Ruth got. What percent of all the votes did Suzanne get?



✓ See your learning facilitator to check your answers and to receive further instructions.

What Lies Ahead



In this section you will learn these skills.

- expressing a percent as a decimal number
- expressing a percent as a fraction
- expressing a fraction as a percent
- expressing a decimal number as a percent



Working Together

As you know, numbers can have many different but equivalent forms.

In this section you will learn how to express a percent as a fraction and a decimal number and how to express a fraction and a decimal number as a percent.

Expressing a Percent as a Fraction and a Decimal Number

Example 1

12% of an iceberg is above the surface of the sea. Express the percent as a fraction and as a decimal number.



Fraction

$$\begin{aligned} 12\% &= \frac{12}{100} \\ &= \frac{3}{25} \end{aligned}$$

$\frac{3}{25}$ of the iceberg is above the surface of the sea.

This is read as 3 twenty-fifths.

or

The ratio of the volume of an iceberg above the sea to the total volume of an iceberg is $\frac{3}{25}$.

This is read as 3 to 25.

Decimal Number

$$\begin{aligned} 12\% &= \frac{12}{100} \\ &= 0.12 \end{aligned}$$

This is read as 12 hundredths.

0.12 of the iceberg is above the sea.

or

The ratio of the volume of an iceberg above the sea to the total volume of the iceberg is 0.12.

This is read as 0 point 12.

Example 2

Ali collects stamps. In his collection the number of stamps from France is 25% of the number of stamps from England. Express the percent as a fraction and as a decimal number.



Fractions

$$25\% = \frac{25}{100} \\ = \frac{1}{4}$$



lowest terms

This is read as 1 fourth or 1 quarter.

The number of stamps from France is $\frac{1}{4}$ of the number of stamps from England.

or

The ratio of the number of stamps from France to the number of stamps from England is $\frac{1}{4}$.

This is read as 1 to 4.

Decimal Number

$$25\% = \frac{25}{100} \\ = 0.25$$

This is read as 25 hundredths.

The number of stamps from France is 0.25 of the number of stamps from England.

or

The ratio of the number of stamps from France to the number of stamps from England is 0.25.

This is read as 0 point 25.

Expressing a Fraction as a Percent and as a Decimal Number

Example 1

An alloy of copper, zinc and lead is used in making clock parts. $\frac{16}{25}$ of the alloy is copper. Express the fraction as a percent and as a decimal number.



Percent

$$\frac{16}{25} = \frac{\boxed{}}{100}$$

$$\frac{16}{25} = \frac{\boxed{64}}{100}$$

($\times 4$)
($\times 4$)

$$\text{So } \frac{16}{25} = 64\%$$

64% of the alloy is copper.

Decimal Number

$$\frac{16}{25} = \frac{64}{100}$$

$$\text{So } \frac{16}{25} = 0.64$$

This is read as 64 hundredths.

0.64 of the alloy is copper.

or

The ratio of the volume of copper to the total volume of alloy is 0.64.

This is read as 0 point 64.

Example 2

Mrs. Ricci's expenses are $\frac{4}{5}$ of Mrs. Morizama's expenses. Express the fraction as a percent and as a decimal number.

Percent

$$\frac{4}{5} = \frac{\boxed{}}{100}$$

$$\frac{4}{5} = \frac{\boxed{80}}{100}$$

$\left(\begin{array}{c} \times 20 \\ \swarrow \end{array} \right)$
 $\left(\begin{array}{c} \times 20 \\ \swarrow \end{array} \right)$

$$\frac{80}{100} = 80\%$$

Mrs. Ricci's expenses are 80% of Mrs. Morizama's expenses.



Decimal Number

$$\frac{4}{5} = \frac{8}{10}$$

$$\frac{8}{10} = 0.8$$

This is read as 8 tenths.

Mrs. Ricci's expenses are 0.8 of Mrs. Morizama's expenses.

or

The ratio of Mrs. Ricci's expenses to Mrs. Morizama's expenses is 0.8.

This is read as 0 point 8.

Expressing a Decimal Number as a Percent and as a Fraction

Example 1

The 1980 Canadian gold coin is an alloy of gold and silver. 0.92 of the coin is gold. Express the decimal number as a percent and as a fraction.

Percent

$$0.92 = \frac{92}{100}$$

$$\frac{92}{100} = 92\%$$

92% of the coin is gold.



Fraction

$$0.92 = \frac{92}{100}$$

$$\frac{92}{100} = \frac{23}{25}$$

This is read as 23 twenty-fifths.

$\frac{23}{25}$ of the coin is gold.

or
The ratio of the gold to the alloy is $\frac{23}{25}$.

This is read as 23 to 25.

Example 2

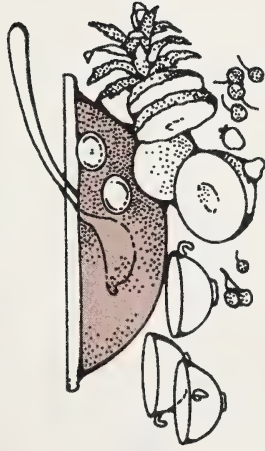
The amount of lemonade in a punch is 0.3 of the amount of ginger ale. Express the decimal number as a percent and as a fraction.

Percent

$$0.3 = \frac{3}{10}$$

$$\frac{3}{10} = \frac{30}{100}$$

$$\frac{3}{100} = 3\%$$



The amount of lemonade in the punch is 30% of the amount of ginger ale.

Fraction

$$0.3 = \frac{3}{10}$$

This is read as 3 tenths.

The amount of lemonade in the punch is $\frac{3}{10}$ of the amount of ginger ale.

or

The ratio of the lemonade to the ginger ale in the punch is $\frac{3}{10}$.

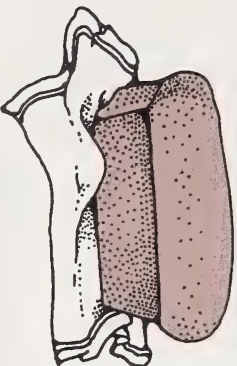
This is read as 3 to 10.

Practice Activities

Space for Your Work

1. A loaf of bread is 60% whole wheat. Express the percent of whole wheat flour in this loaf of bread as these.

- a. a fraction in lowest terms
- b. a decimal number



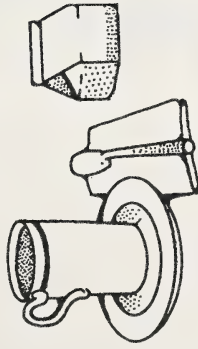
2. The label on a sweater tells that it is made of wool fibre and acrylic fibre. Express each part as these.

- a. a fraction in lowest terms
- b. a decimal number



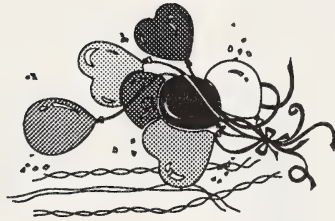
3. Coffee cream is 18% milk fat. Express the percent of milk fat as these.

- a. a fraction in lowest terms
- b. a decimal number



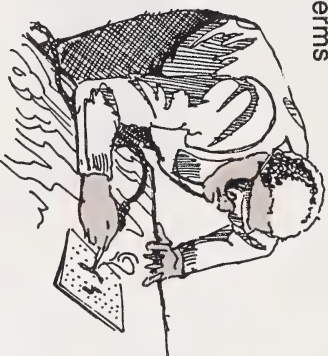
4. In a package, the number of red balloons is 40% of the number of yellow balloons. Express the percent as these.

- a. a fraction in lowest terms
- b. a decimal number



5. A solder is made of zinc, tin and lead. The amount of tin is 60% the amount of lead. Express the percent as these.

- a. a fraction in lowest terms
- b. a decimal number



6. About $\frac{3}{4}$ of the computer class were present. Express the fraction as these.

- a. a percent
- b. a decimal number



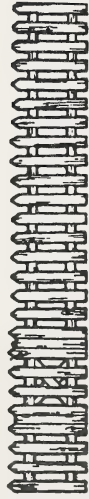
7. The baseball batter hit safely in 0.25 of the times he was up to bat. Express the decimal number as these.



- a percent
- a fraction

8. The amount of fence Bruce painted is $\frac{1}{5}$ the amount Joan painted. Express the fraction as these.

- a percent
- a decimal



Space for Your Work

9. Jake's age is 0.3 of his father's age. Express the decimal as these.

- a. a percent
- b. a fraction



10. Complete this table. Give the fractions in lowest terms.

	Fraction	Decimal	Percent
a.		0.01	
b.			2%
c.	$\frac{1}{10}$		
d.		0.35	
e.			20%
f.		0.4	
g.	$1\frac{1}{2}$		
h.		0.6	



See your learning facilitator to check your answers and to receive further instructions.

Extra Practice

Space for Your Work

Computer Alternative



1. Do Lessons 11, 12, 13, 14, 15, 16, 20 and 21 of the "Ratio and Percent" disk from the *Package Computer Drill and Instruction: Mathematics, Level D*. Read the instructions in the folder with the disk before using the program.

Remember if you need help, press the SHIFT key and the  key.

Print Alternative



2. Express each percent as a decimal number.
 - a. 67%
 - b. 68%
 - c. 69%
 - d. 70%

3. Express each percent as a fraction in lowest terms.

a. 20%

b. 21%

c. 22%

d. 23%

4. Express each of these fractions as a percent and as a decimal number.

a. $\frac{1}{10}$

b. $\frac{4}{5}$

c. $\frac{3}{4}$

d. $\frac{1}{2}$

Space for Your Work

5. Express each of these decimal numbers as a percent and as a fraction in lowest terms.
- a. 0.2
 - b. 0.8
 - c. 0.85
 - d. 0.95



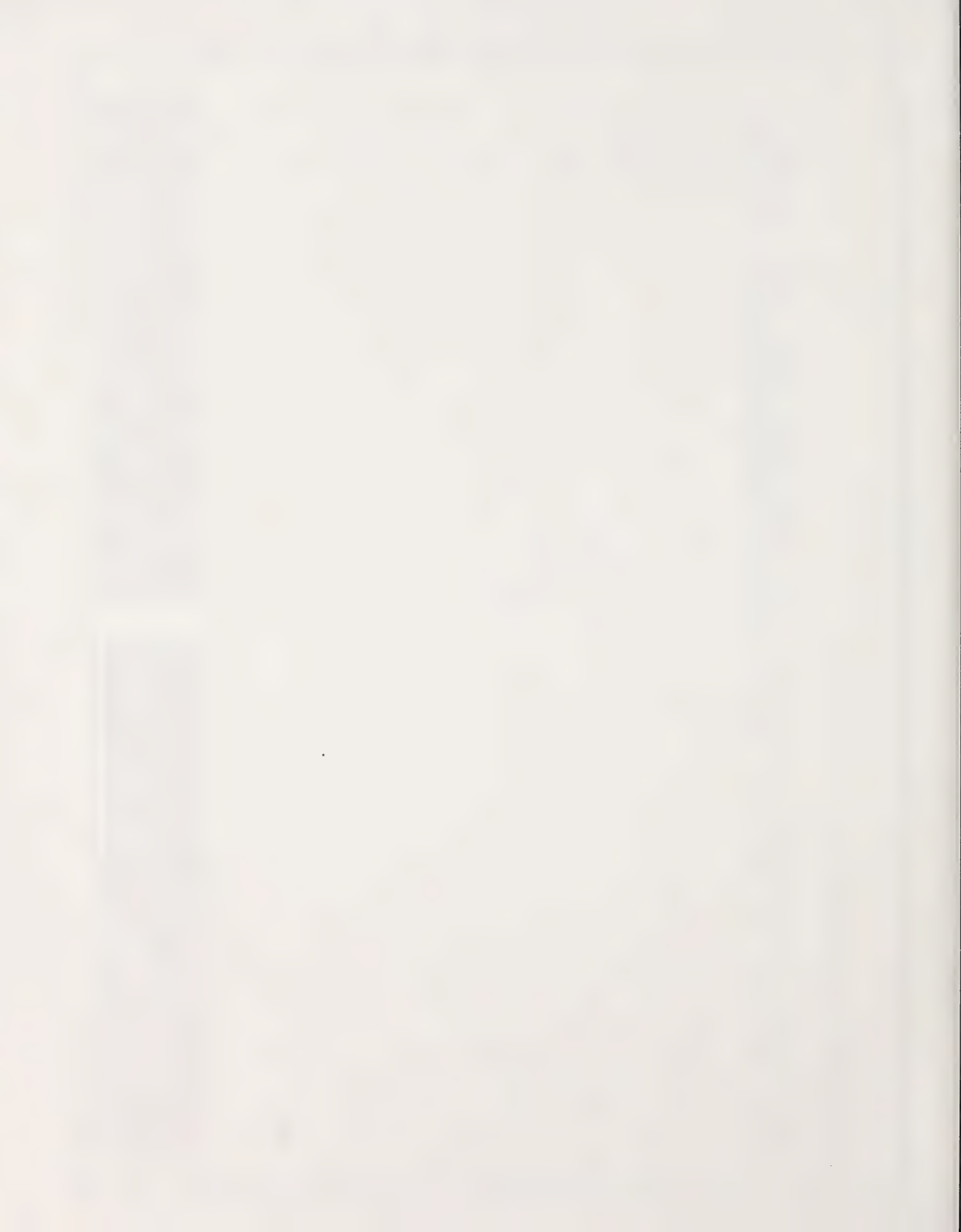
See your learning facilitator to check your answers and to receive further instructions.

Concluding Activities

Cut out the squares of the percent puzzle at the end of this booklet. Fit them together so that the edges that are next to each other and are up or down from each other name the same ratio.



See your learning facilitator to check your answers and to receive further instructions.



What Lies Ahead



In this section you will learn these skills.

- estimating a percent of a number
- finding a percent of a number using paper and pencil methods or a calculator



Working Together

Percent is a good way to describe situations, but you cannot compute with a percent. You must rename the percent to a fraction or to a decimal number.

Estimating

Sometimes you only need to estimate the percent of a number in everyday life.

Example 1

Mr. Allan decides to leave his waiter 15% of the food bill as a tip. If the food bill was \$67.98, how much should Mr. Allan leave for the waiter as a tip?



An estimate is sufficient in this situation. Remember estimation is done mentally.

Solution

To estimate use rounding:

$$\begin{aligned} 15\% \text{ of } 67.98 &\approx 15\% \text{ of } 70 \\ &\approx 0.15 \times 70 \\ &\approx 70 \times 0.15 \\ &\approx 10.50 \end{aligned}$$

Mr. Allan's tip for the waiter should be about \$10.50.

Or use front-end digits:

$$\begin{aligned} 15\% \text{ of } 67.98 &\approx 10\% \text{ of } 60 \\ &\approx 0.1 \times 60 \\ &\approx 6.00 \end{aligned}$$

Front-end digits will give a low estimate so you should compensate:

$$\begin{aligned} 5\% \text{ of } 60 &= 0.05 \times 60 \\ &= 3.00 \\ \text{So } 15\% \text{ of } 67.98 &\approx 6 + 3 \\ &\approx 9 \end{aligned}$$

Mr. Allan's tip for the waiter should be about \$9.

At other times you need to find an exact answer.

Example 2

Mr. Kurtz sells cars. He earns 5% of his sales. If Mr. Kurtz sells a car for \$18 050, how much does he earn on this one car alone?



An exact answer is required here.

Even if an exact answer is required, an estimate will provide a “ballpark answer” with which to compare the calculated answer.

Solution

To estimate you can round:

$$\begin{aligned} 5\% \text{ of } 18\,050 &\approx 5\% \text{ of } 20\,000 \\ &\approx 0.05 \times 20\,000 \\ &\approx 1\,000 \end{aligned}$$

Mr. Kurtz would earn about \$1 000 on this car alone.

Or you can use front-end digits:

$$\begin{aligned} 5\% \text{ of } 18\,050 &\approx 5\% \text{ of } 10\,000 \\ &\approx 0.05 \times 10\,000 \\ &\approx 500 \end{aligned}$$

This is a low estimate so you will need to compensate:

$$\begin{aligned} 5\% \text{ of } 8\,000 &= 0.05 \times 8\,000 \\ &= 400 \\ \text{So } 5\% \text{ of } 18\,050 &\approx 500 + 400 \\ &\approx 900 \end{aligned}$$

Mr. Kurtz would earn about \$900 on this car alone.

When you are estimating using rounding, you may round some or all of the numbers.

Example 1

A package of cheese has 23% milk fat. If the package holds 275 g of cheese, about how much milk fat is there in the package of cheese?



Solution

The amount of milk fat is estimated this way:

"of" means multiply

$$\begin{aligned} & \downarrow \\ 23\% \text{ of } 275 \\ &= 0.23 \times 275 \\ &\approx 0.2 \times 300 \\ &\approx 60 \end{aligned}$$

There are about 60 g of milk fat in 275 g of cheese.

Example 2

Andy got 73% of the questions on a test right. If there were 35 questions on the test, about how many questions did Andy get right?



Solution

The number of questions Andy got right is estimated this way:

“of” means multiply

$$\begin{aligned} 73\% \text{ of } 35 \\ &= 0.73 \times 35 \\ &\doteq 0.7 \times 35 \\ &\doteq 24.5 \end{aligned}$$

Andy got about 25 questions right out of a total of 35 questions.

Introductory Activities

Space for Your Answer

1. Circle the best estimate for each of these percent problems.

a. 98% of 680	0.68,	6.8,	68,	680
b. 26% of 399	1,	10,	100,	1000
c. 33% of 180	0.6,	6,	60,	600
d. 49% of 105	0.5,	5,	50,	500
e. 22% of 450	0.9,	9,	90,	900

2. Estimate an answer for each of the following.

- a. 98% of 60
- b. 11% of 750
- c. 22% of 50
- d. 20% of 189
- e. 50% of 59
- f. 82% of 605

Computer Alternative



3. Do the program "Making Sense of Percents" on Disk B of MAC 6. Read the instructions in the folder with the disk before using the program.



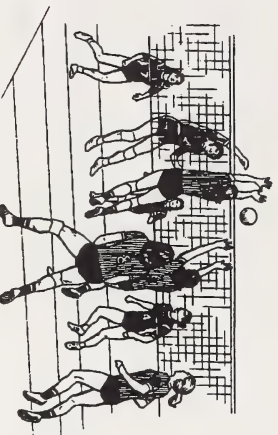
See your learning facilitator to check your answers and to receive further instructions.



Working Together

Calculating

The volleyball team sold \$375.00 worth of chocolate bars. If they kept 20% of the sales, how much did they keep for themselves?



Solution

You can calculate using paper and pencil.

$$\begin{aligned} &20\% \text{ of } 375 \\ &= 0.20 \times 375 \\ &= 75 \end{aligned}$$

The team kept \$75 for themselves.

You can use a calculator to find a percent of a number.

$$20\% \text{ of } 375 = 0.20 \times 375$$

Key Press	Display
0	
.	
2	
x	
3	
7	
5	
=	75

Most calculators have a percent key which is



This saves the need of changing the percent to a decimal number and the need for pressing the **=** key. This is what happens in this case.

Key Press	Display
3	
7	
5	
x	
2	
3	
%	75

Note

Enter the number to be multiplied first and the percent key last.

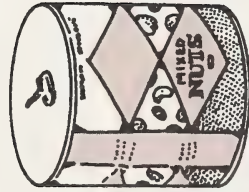
Practice Activities

Space for Your Work

1. The seating capacity of a football stadium is 10 800. At one game 75% of the seats were occupied. How many people were at the football game?



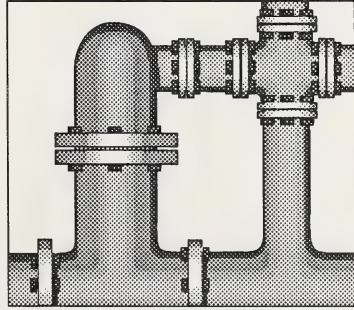
2. About 80% of the nuts in a can of mixed nuts are peanuts. In a handful of 20 nuts, how many peanuts are there?



3. Find the amount of milkfat contained in 1000 mL of each type of cream in the chart below.

Type	Milkfat
a. whipping cream	35%
b. coffee cream	18%
c. cereal cream	9%
d. partly-skimmed milk	2%

4. Martinez uses solder to fix his pipes. Solder is a mixture of tin and lead. In hard solder 65% of the total mass is tin. Find the amount of lead and tin in a 5 kg bar of hard solder.



See your learning facilitator to check your answers and to receive further instructions.

Extra Practice

Space for Your Work

Computer Alternative



1. Do Lesson 17 of the "Ratio and Percent" disk from the Package SRA *Computer Drill and Instruction: Mathematics, Level D*. Read the instructions in the folder with the disk before using the program.

Remember if you need help, press the SHIFT key and the  key.

Print Alternative



2. Calculate each of the following.
 - a. 25% of 60
 - b. 32% of 90
 - c. 21% of 85
 - d. 96% of 340
 - e. 42% of 1280

3. Play "Percent Tic-Tac-Toe¹." The directions are given below. The game board is in the appendix. You will need two-coloured counters.

Follow these directions.

- Two players alternate turns.
- A player picks two numbers from the number table and computes the percentage one number is of the other. A player who picks 25 and 75 computes 25 percent of 75 or 75 percent of 25.
- The player then covers an uncovered box on the game board that is closest to his or her answer.
- The first player to get three in a row (horizontally, vertically, or diagonally) wins.



See your learning facilitator to check your answers and to receive further instructions.

¹National Council of Teachers of Mathematics for excerpts from *The Arithmetic Teacher*, January, 1988, Reston, Virginia.



Working Together

Sometimes you encounter problems like this which can be solved two ways.

Example 1

Of 80 gymnasts, 45% were girls. How many boys were gymnasts?



Solution 1

Here is one way to solve the problem.

Find the number of girls.

$$45\% \text{ of } 80$$

$$= 0.45 \times 80$$

$$= 36$$

There are 36 girls who are gymnasts.

Find the number of boys.

$$80 - 36 = 44$$

44 of the gymnasts are boys.

Solution 2

Here is another way to solve the problem:

Find the percent of the gymnasts who are boys.

$$100\% - 45\% = 55\%$$

$$55\% \text{ of } 80$$

$$= 0.55 \times 80$$

$$= 44$$

44 of the gymnasts are boys.

Concluding Activities

1. In a plant of 2000 employees, 2% were absent one day. How many employees were present on this particular day?



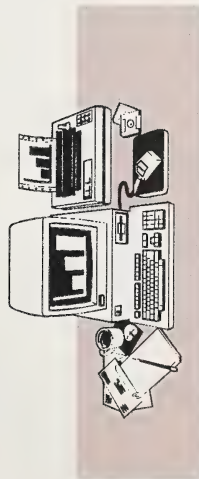
Space for Your Work

Space for Your Work

2. 72% of the earth's surface is water. If 25% of the dry land is forested, how much of the earth is forest? Leave your answer as a percent.



3. In the city of Exon, population 40 000, 10% of the population have two computers each, 70% of the remainder have none, and all the others have one computer each. How many computers are there in Exon?



See your learning facilitator to check your answers and to receive further instructions.



What Lies Ahead



In this section you will review the skills you have learned in Sections 7 to 10.

- expressing a ratio out of 100 as a percent
- expressing a ratio not out of 100 as a percent
- expressing a percent as a decimal and a fraction
- finding a percent of a number



Working Together

At this time it is a good idea to review Part Two. Turn to Section 7 in this Module Booklet and correct any errors you may have made in the Pretest. You may be pleasantly surprised to discover how much you have learned about percents!



What Lies Ahead



The Module Assignment in this Module Conclusion will evaluate the achievement of the objectives for this module.



Working Together

Now that you have studied Module 5 and you have done the required practice, you should be ready for the Module Assignment.

Module Assignment

Turn to the Assignment Booklet and complete the Module Assignment independently. You may refer to your notes, but do not get help from anyone. Afterwards, submit the assignment for a grade and feedback from your teacher.



APPENDIX



Equivalent ratios: ratios that have the same simplest form

$\frac{4}{10}$ and $\frac{6}{15}$ are equivalent ratios.

First term: the first number in a ratio

2 is the first term of 2 : 3.

Gear ratio: the ratio of the number of teeth on the first gear to the number of teeth on the second gear

Golden ratio: the ratio of the length to width of the most eye-appealing rectangles

This ratio is 1.618.

Lowest term ratio: a ratio using the smallest whole numbers possible

Percent: a ratio that compares an amount to 100

85% means $\frac{85}{100}$

Proportion: an equation showing that two ratios are equal

$\frac{4}{5} = \frac{24}{30}$ is a proportion

Proportional: having the same ratio

Proportional ratios: ratios that are equivalent

$\frac{2}{3}$ and $\frac{4}{6}$ are proportional ratios.

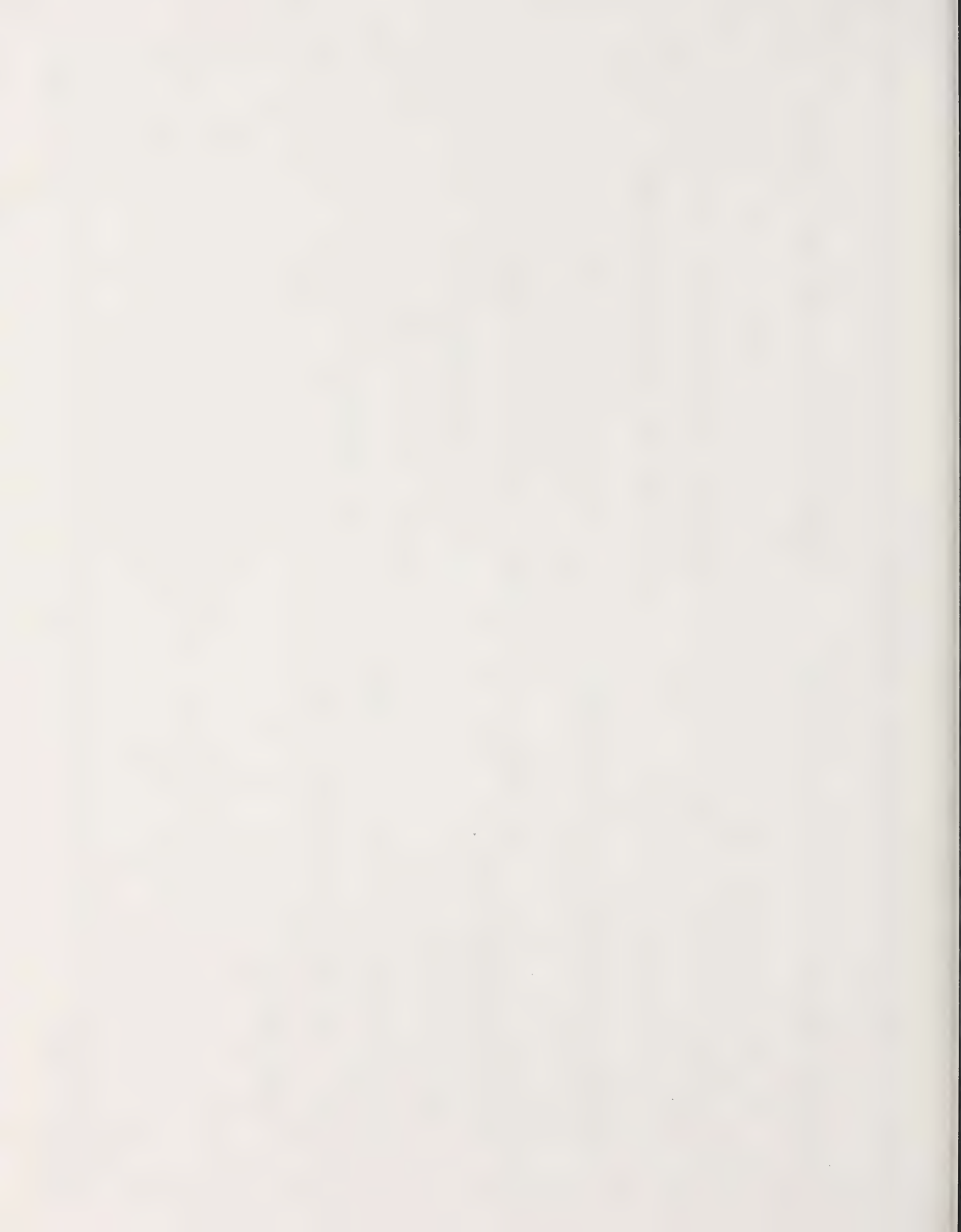
Ratio: a comparison of two numbers

Second term: the second number to a ratio

3 is the second term of 2 : 3

Term: the numbers in a ratio

$\frac{2}{3}$ ← first term
 ← second term



PERCENT PUZZLE

1 50% $\frac{4}{12}$ $1\frac{1}{7}$	200% $\frac{2}{10}$ $3\frac{1}{2}$ $1\frac{1}{8}$	70% $\frac{3}{7}$	25% $\frac{2}{3}$
$\frac{2}{12}$ 60%	0.8 100% $\frac{5}{3}$ $\frac{6}{3}$	$\frac{2}{14}$ $\frac{2}{16}$ $\frac{5}{8}$ $3\frac{3}{4}$ $1\frac{1}{2}$	$1\frac{1}{3}$
$\frac{10}{16}$ $\frac{6}{16}$ $2\frac{2}{6}$	0.3 0.75 $\frac{12}{24}$	$\frac{10}{12}$ 0.7 $1\frac{6}{14}$	150% $\frac{3}{10}$
$4\frac{4}{6}$ $1\frac{2}{3}$ $0\frac{2}{2}$	0.25 $4\frac{4}{5}$ $5\frac{5}{6}$	0% $1\frac{1}{2}$ $1\frac{1}{6}$ $1\frac{1}{3}$	0.6 $3\frac{3}{8}$



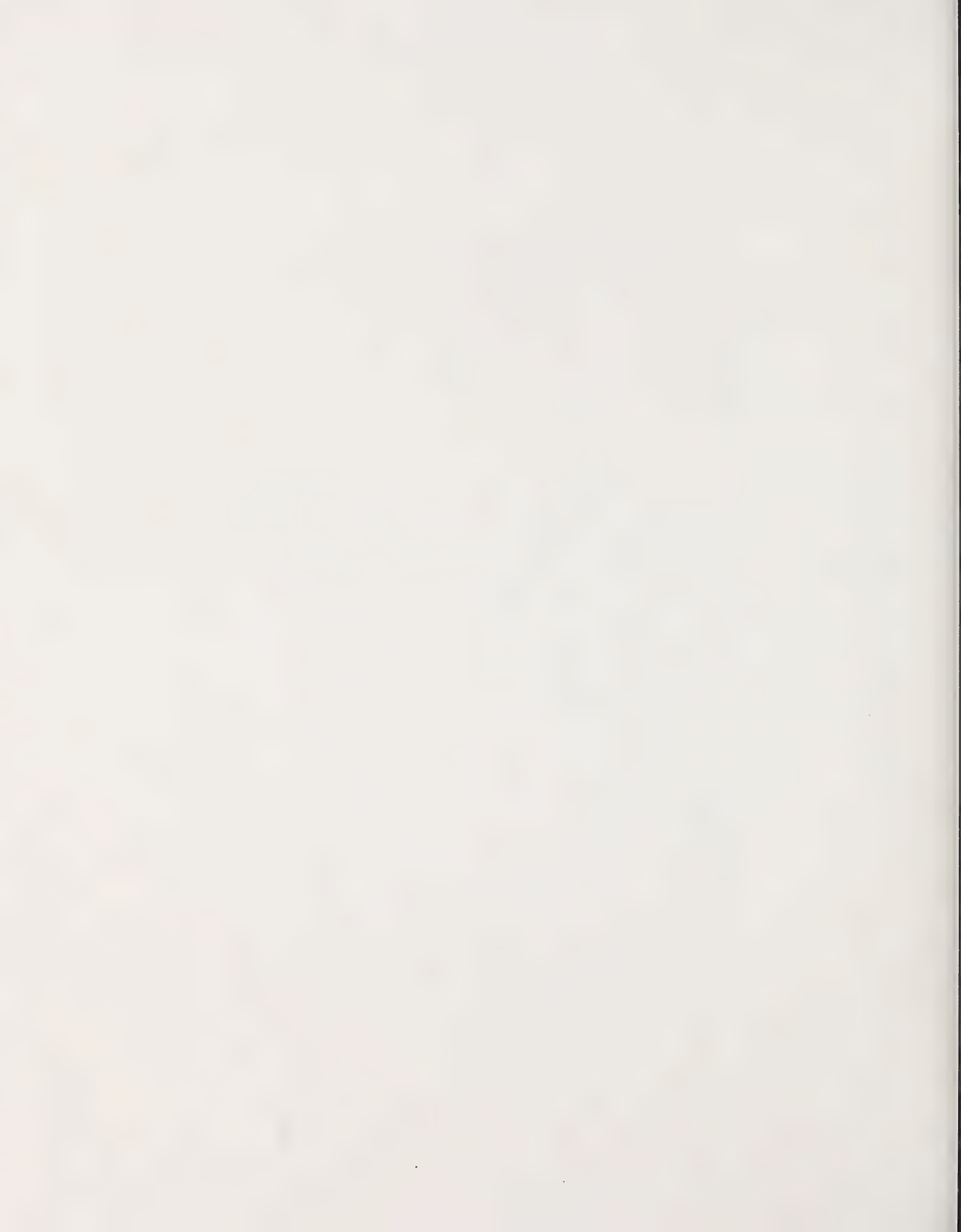
Game Board

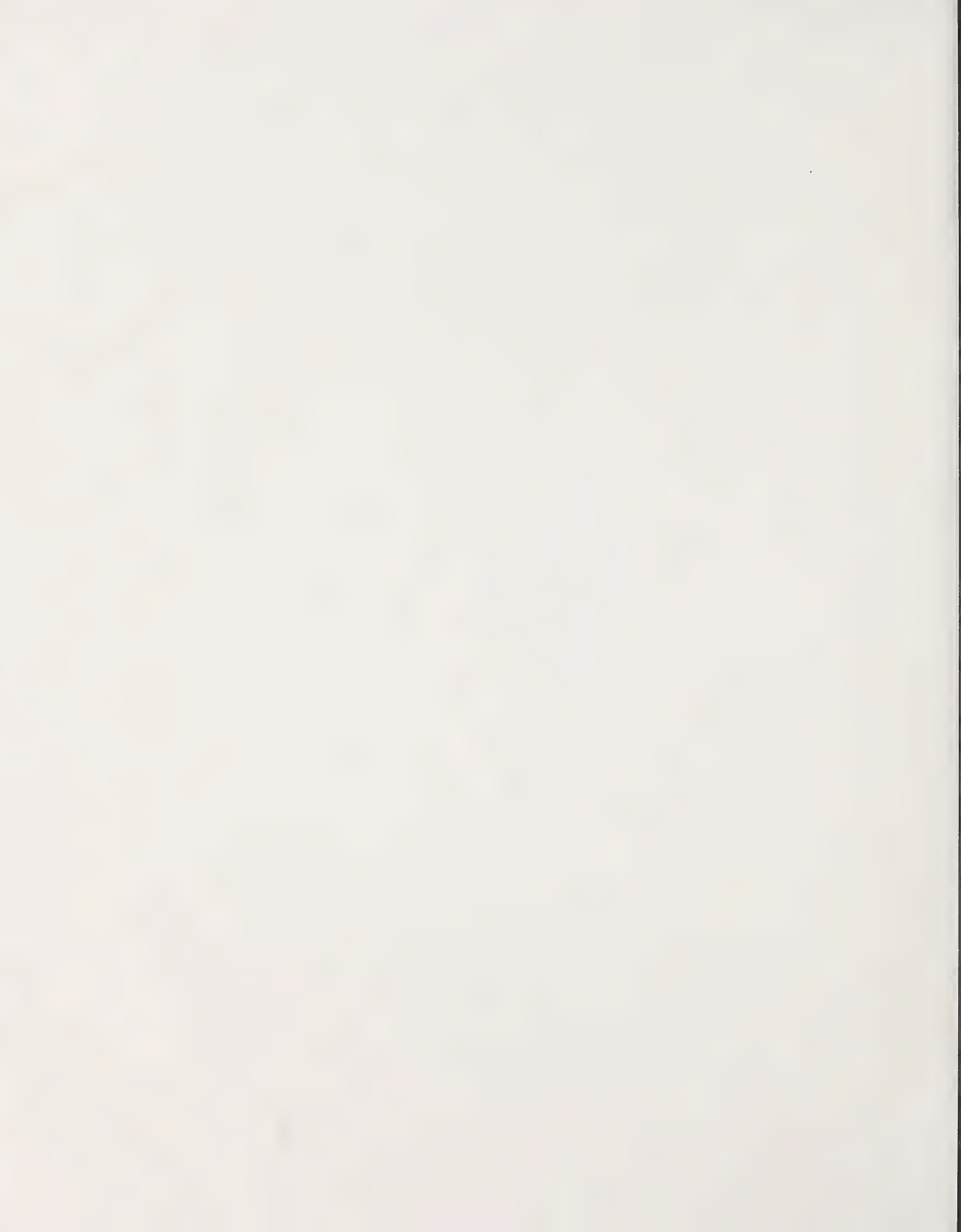
10	5	30	35
25	60	80	70
20	75	90	85
15	50	40	95

Number Table

5	37	15	12
40	96	54	65
55	105	150	45
10	25	75	8
20	80	60	32











Mathematics 7

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